

ASAP

Dart Aerospace Ltd.

Date: Monday, 5/7/2007 3:24:15 PM  
 User: Kim Johnston

## Process Sheet

Customer : CU-DAR001 Dart Helicopters Services	Drawing Name : BLADE FITTING
Job Number : 32232	
Estimate Number : 12299	
P.O. Number :	Part Number : D3488041
This Issue : 5/7/2007 S.O. No. :	Drawing Number : D3488 / DSK101
Prsht Rev. : NC	Project Number : N/A
First Issue : 1 / 1 Type : MACHINED PARTS	Drawing Revision : B / D
Previous Run : 30111	Material :
Written By :	Due Date : 5/30/2007 Qty: 31 Um: Each
Checked & Approved By : <u>07.05.07</u>	
Comment : Est Rev: A New Issue 06-02-28 JLM	
Est Rev: B As per Rev B 06-03-30 JLM	

## Additional Product

Job Number:



Seq. #:	Machine Or Operation:	Description :
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1.0	D6103003	alum billet
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Comment: Qty.: 1.0000 Each(s)/Unit Total : 20.0000 Each(s)

Alluminum Round Billet D6103-003

Batch: B33275

2.0	MORI SEIKI	MORI SEIKI CNC LATHE LARGE
-----	------------	----------------------------



Comment: MORI SEIKI CNC LATHE LARGE

1-Turn as per Dwg DSK 101 & Folio FA625

2-Deburr

J.L. / J.B. 07/07/20

3.0	QC2	INSPECT PARTS AS THEY COME OFF MACHINE
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Comment: INSPECT PARTS AS THEY COME OFF MACHINE

J.L. / J.B. 07/07/20

4.0	HAAS1	HAAS CNC VERTICAL MACHINING #1
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Comment: HAAS CNC VERTICAL MACHINING #1

1-Machine as per Folio FA625 & Dwg D3488

2-Deburr

J.F. 1 07/07/25

5.0	QC2	INSPECT PARTS AS THEY COME OFF MACHINE
-----	-----	--



Comment: INSPECT PARTS AS THEY COME OFF MACHINE

J.F. 1 07/07/25

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes ☒ No ☐ DQA: 11 Date: 07.08.14  
 QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
07.07.23	2.0	INSIDE BORE HAS CHATTER MARKS. VARIOUS SIZES	PH per USF 042 07.07.23	RE-MACHINE BORE TO 2.200" MAX. SEE ATTACHED ANALYSIS	PH per USF 042 07.07.23 J.L.	PH per USF 042 07.07.23	PH per USF 042 07.07.23	
07.07.27	4.0	Qty(1) dimension 1.802 is measured to be <del>1.802</del> 1.832"	PH per USF 042 07.07.27	PART IS ACCEPTABLE see attached email	PH per USF 042 07.07.27	PH per USF 042 07.07.27	PH per USF 042 07.07.27	

NOTE: Date & initial all entries

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Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: BLADE FITTING

Job Number: 32232

Part Number: D3488041

Job Number:



Seq. #:

Machine Or Operation:

Description :

6.0

QC8

SECOND CHECK



*ml 07/08/07*

(31)

Comment: SECOND CHECK

7.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

*ml 07/08/09*

(31)

8.0

POWDER COATING

POWDER COATING



*M105068*

(31X)

Comment: POWDER COATING

Powder Coat White Gloss (Ref: 4.3.5.1) as per QSI 005 4.3

*ml 07/08/10*

9.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



*ml 07/08/10*

(31)

Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

10.0

ALS71032225

INSERT



*\* ✓*

Comment: Qty.: 4.0000 Each(s)/Unit Total : 80.0000 Each(s)

Pick:

Qty Part Number Description Batch  
4 ALS7-1032-225 Insert

*M19393 ml*

11.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



(31X)

Comment: HAND FINISHING RESOURCE #1

Install Inserts as per Dwg D3488

*ml 07/08/10*

12.0

QC5

INSPECT WORK TO CURRENT STEP



*checked  
all  
inserts*

Comment: INSPECT WORK TO CURRENT STEP

*ec 07/08/10 (+ 31)*

13.0

PACKAGING 1

PACKAGING RESOURCE #1



(31X)

Comment: PACKAGING RESOURCE #1

Identify and Stock

Location:

*Finishing ml 07/08/11*

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

Date: Monday, 5/7/2007 3:24:15 PM  
User: Kim Johnston

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: BLADE FITTING

Job Number: 32232

Part Number: D3488041

Job Number:



Seq. #:

Machine Or Operation:

Description :

14.0

QC21

FINAL INSPECTION/W/O RELEASE



Comment: FINAL INSPECTION/W/O RELEASE

07-08-14

Job Completion



C207108113

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

<b>DART AEROSPACE LTD</b>		<b>Work Order:</b> 32232
<b>Description:</b> Blade Fitting, LH		<b>Part Number:</b> D3488-1
<b>Inspection Dwg:</b> D3488 <b>Rev:</b> B		<b>Page 1 of 1</b>

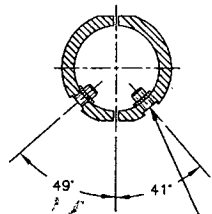
### FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article      ☐ Prototype

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
0.125	+/-0.010	.127	✓			
2.620	+/-0.010	2.620	✓			
0.793	+/-0.010	.795	✓			
1.351	+/-0.010	1.348	✓			
1.317	+/-0.010	1.312	✓			
90°	+/-0.1°	90°	✓			
1.802	+/-0.010	1.801	✓			
Ø0.508	+0.006/-0.001	.510	✓			
R0.062	+/-0.010	.062	✓			
1.500	+/-0.010	1.499	✓			
8.000	+0.030/-0.000	8.023	✓			
11.18	+/-0.030	11.179	✓			
Ø0.484	+0.005/-0.001	.486	✓			
1.180	+/-0.010	1.180	✓			
3.150	+/-0.010	3.150	✓			
3.070	+/-0.010	3.069	✓			
0.590	+/-0.010	.590	✓			
0.125	+/-0.010	.125	✓			
1.005	+/-0.010	1.005	✓			
3.500	+/-0.010	3.500	✓			
Ø0.297	+0.005/-0.000	.301	✓			
Ø0.430	+/-0.010	.434	✓			
0.100	+/-0.010	.101	✓			

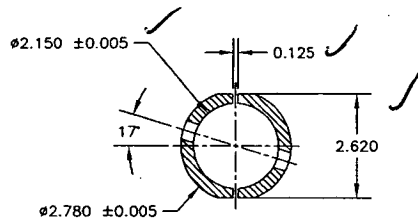
<b>Measured by:</b> J.L.	<b>Audited by:</b> [Signature]	<b>Prototype Approval:</b> N/A
<b>Date:</b> 07/07/26	<b>Date:</b> 07/07/26	<b>Date:</b> N/A

Rev	Date	Change	Revised by	Approved
A	06.03.31	New Issue	KJ/JLM	[Signature]



SECTION B-B

Ø0.297  
C'BORE Ø0.430 x 0.100  
INSTALL ALS4-1032-225 (OR AKS4-1032-225  
OR ALS7-1032-225 OR AKS7-1032-225)  
INSERTS AFTER FINISH  
(4 PLACES)



SECTION A-A

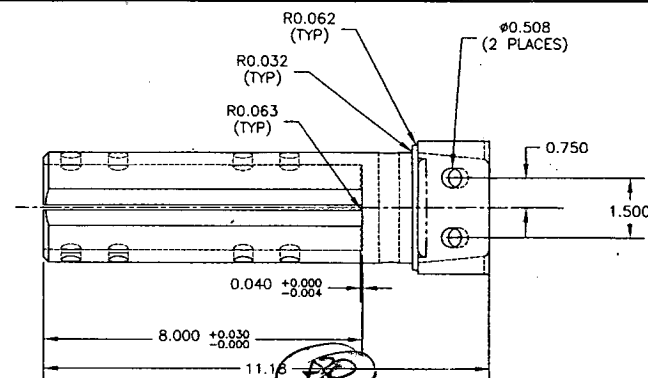
**D3488-041/-042 BLADE FITTING ASSEMBLY PARTS LIST**

QTY -041	QTY -042	PART NUMBER	DESCRIPTION
X		D3488-041	BLADE FITTING ASSEMBLY (LH)
	X	D3488-042	BLADE FITTING ASSEMBLY (RH)
1		D3488-1	BLADE FITTING (LH)
	1	D3488-2	BLADE FITTING (RH)
4	4	ALS4-1032-225 or AKS4-1032-225 or ALS7-1032-225 or AKS7-1032-225	INSERT

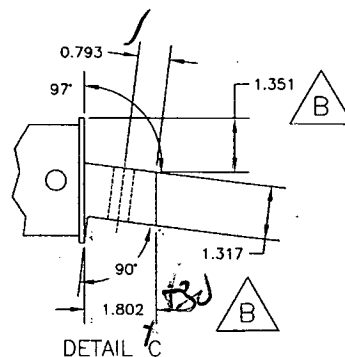
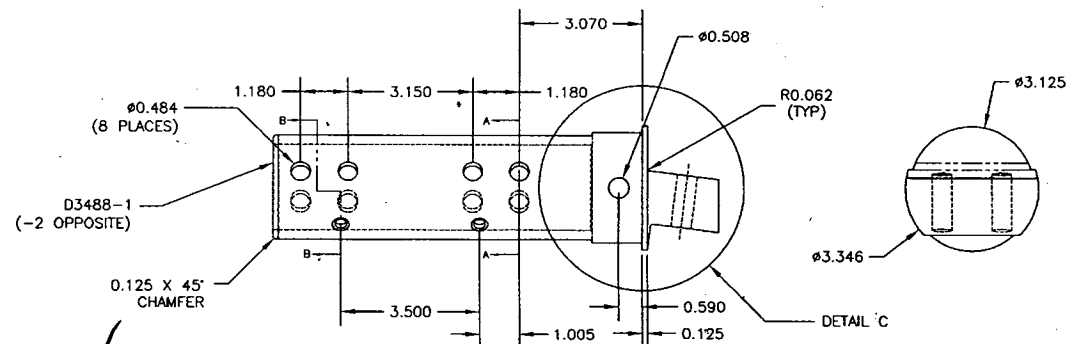
**D3488-041/-042 BLADE FITTING**

- MATERIAL: MAKE D3488-1/-2 FROM ALUMINUM 7075-T7351 ROUND BAR  
PER QQ-A-225/9  
(REF. DART MATERIAL SPEC M7075T73R)
- FINISH: ACID ETCH, ALODINE PER DART QSI 005 4.1  
POWDER COAT WHITE (REF 4.3.5.1) PER DART QSI 005 4.3
- BREAK UNMARKED SHARP EDGES 0.010 TO 0.020
- INSTALL INSERTS AFTER POWDER COAT
- ALL DIMENSIONS ARE IN INCHES
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED

NO. 32232  
 WORK ORDER  
 WITHOUT NOTICE  
 UNCONTROLLED COPY  
 SUBJECT TO AMENDMENT  
 ENGINEERING  
 RETURN TO  
 SHIP COPY



1673



D3488-041 SHOWN (D3488-042 OPPOSITE)

**RELEASED**  
 06.03.15 PH  
 PER OS  
 ECN #789

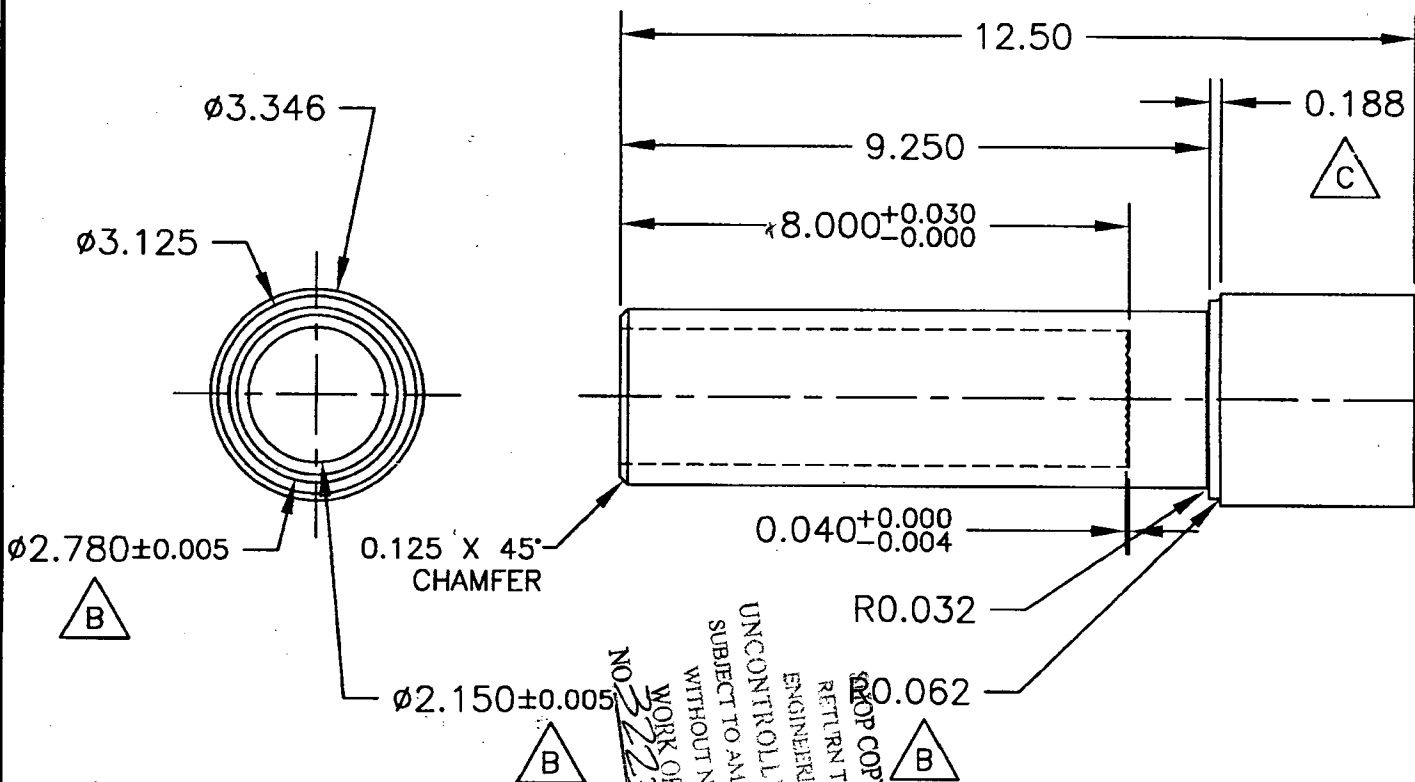
B	06.03.15	CHANGE THICKNESS
A	05.12.20	NEW ISSUE
DESIGN	PH	DRAWN BY PH
CHECKED	PH	APPROVED PH
DATE	06.03.15	TITLE
		BLADE FITTING
		DART DART AEROSPACE USA, INC. PORT HADLOCK, MA
		DRAWING NO. D3488
		REV. B SHEET 1 OF 1
		SCALE 1:3

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 DART AEROSPACE USA, INC.



**DART**

DESIGN	DRAWN BY	DART AEROSPACE USA, INC.	
014	014	PORT HADLOCK, WA	
CHECKED	APPROVED	DRAWING NO.	REV. D
<i>[Signature]</i>	<i>[Signature]</i>	DSK 101	SHEET 1 OF 1
DATE	TITLE	SCALE	
06.05.09	D3488-1/-2 TURNING DETAIL	1:3	
A	05.12.21	NEW ISSUE	
B	06.03.02	ADD TOLERANCES AND RADIUS	
C	06.04.17	0.188 WAS 0.125	
D	06.05.09	REMOVE DIAMETER FOR CHAMFER	



**DSK 101**

- 1) MATERIAL: MAKE FROM ALUMINUM 7075-T7351 ROUND BAR PER QQ-A-225/9 (REF. DART MATERIAL SPEC M7075T73R)
- 2) FINISH: NONE
- 3) BREAK UNMARKED SHARP EDGES 0.010 TO 0.020
- 4) ALL DIMENSIONS ARE IN INCHES
- 5) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED

**DART**

RH  
07.07.23

Re: 03488-041/-042 Blade fitting deviation

Based on approved SR-D350-630-2 Rev. B  
the ID of the bore can be opened to  $\phi 2.200$  max.  
As shown the I/C, A, D are greater for the  
Dart blade fitting compared to the typical fitting

- Approval per QSI 042

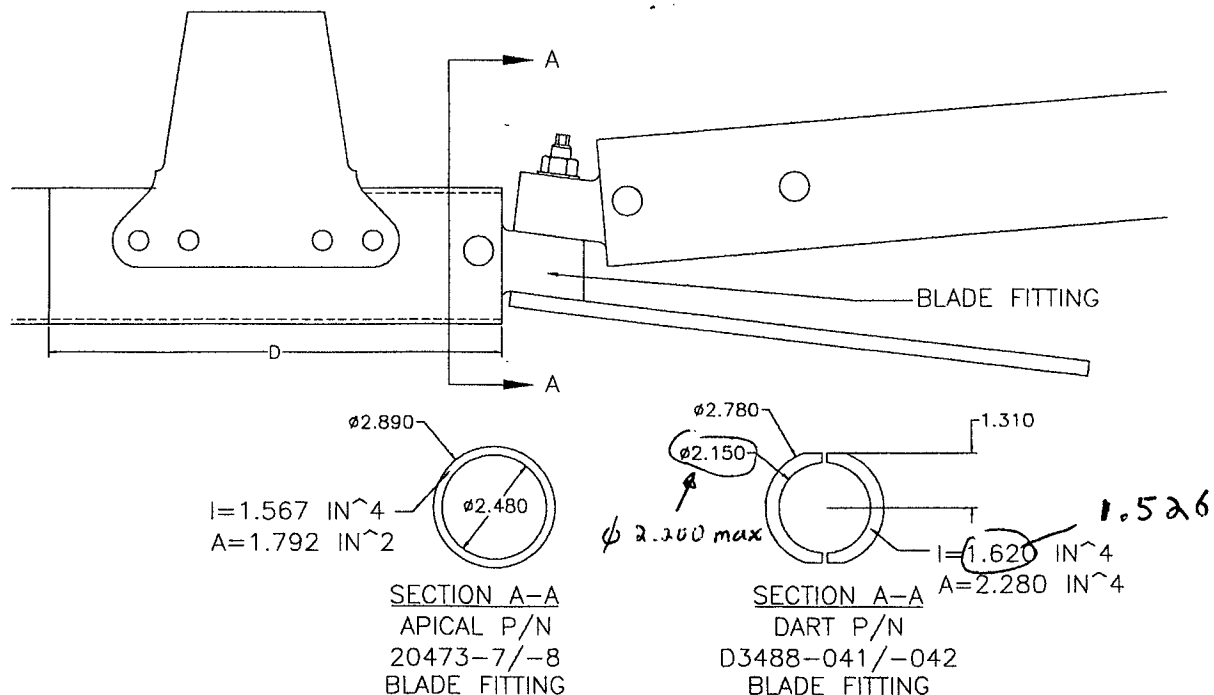
Cause: Chatter marks from machining during BORE  
operation

For installation of the Apical Tri-bag and Apical Cylindrical Float bag systems onto OEM skidtube; it is required that the OEM P/N 350A41-1077-24/-25 blade fitting be substituted with the Apical P/N 20473-7/-8 blade fitting. In the proposed Dart skidtube configuration, the Dart D3488-041/-042 blade fitting will replace the Apical P/N 20473-7/-8 blade fitting.

In the Dart system, blade fitting D3488-041/-042 will be used to transfer load into the web of the skidtube assembly. On the outside of the skidtube, D3488-041/-042 is dimensionally identical to the Apical P/N 20473-7/-8 blade fitting and is manufactured from the same 7075-T7351 material. Therefore, the Dart blade fitting and the Apical blade fitting have identical structural capability. The longitudinal location of the holes on the D3488-041/-042 blade fitting used to mount the aft crosstube are identical to the Apical P/N 20473-7/-8 blade fitting. On the inside of the skidtube, D3488-041/-042 has been designed to withstand higher bending moments than the Apical fitting.

The following table compares the Dart D3488-041/-042 blade fitting to the Apical 20473-7/-8 blade fitting.

Component	Dart D3488-041/-042	Apical P/N 20473-7/-8
Material	7075-T7351 per QQ-A-225/9	7075-T7351 per QQ-A-225/9
(I) Moment of Inertia of portion inside skidtube	1,526 1.620 in <sup>4</sup> (from D3488-041/-042 dwg)	1.567 in <sup>4</sup> (from D20473-7/-8 dwg)
(C) Distance to outer fibers	1,310 1.310 in (from D3488-041/-042 dwg)	1.445 in (from 20473-7/-8 dwg)
(A) Area at section A-A	2,116 2.280 in <sup>2</sup>	1.792 in <sup>2</sup>
Z=I/C at section A-A	1,165 1.234 in <sup>3</sup>	1.084 in <sup>3</sup>
D	10.69 10.69 in	10.53 in



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Revision: B

Date: 06.02.23

Because the material used to manufacture both blade fittings is identical, the fact that the I/C, A, and D for the Dart blade fitting is greater than the I/C, A, and D for the Apical blade fitting demonstrates that the Dart blade fitting can withstand higher bending moments and shear loads than the Apical blade fitting and less localized load is transferred into the surrounding skidtube at the fwd end of the blade fitting.

Finally, the Dart skidtube installation does not change any of the Apical hardware required to install the floats onto the skidtube or attach the aft extension onto the blade fitting. Therefore, this hardware is acceptable by identity.

#### 4.0 Conclusion

Based on the qualitative analysis presented in this report, it has been demonstrated that the Dart D350-636-011/-012/-013/-014 skidtubes will be as good or better than the OEM 350A41-1016-1061/-1063/-1070/-1161/-1163/-1171 skidtube in terms of withstanding the loads from the Apical Cylindrical and Tri-bag float system. Additionally, this report demonstrates that the Dart skidtube can withstand localized bearing load with substantial margins of safety.

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Revision: B

Date: 06.02.23

## Peter Hum

---

**From:** David Shepherd [dshepherd@dartaero.com]  
**Sent:** July 26, 2007 10:40 PM  
**To:** 'Peter Hum'  
**Subject:** RE: D3488 length too long

Holes must be further aft than they are supposed to be if the 0.793" dimension is OK. However, I think it is still an acceptable part.

David

---

**From:** Peter Hum [mailto:phum@dartaero.com]  
**Sent:** Thursday, July 26, 2007 2:10 PM  
**To:** 'David Shepherd'  
**Subject:** D3488 length too long

David,

Production is making a D3488-041/-042 blade fitting. The length of the exterior portion is 0.030" too long (see the attached sketch), nominal is 1.802" (+/- 0.010") and the measured is 1.832". The length to the holes (0.793") is okay. This part is not covered in the stress report. This will not affect the installation of the D2741 blade or any of Apical float kits.

Is this deviation acceptable?

Thanks  
Peter

No virus found in this incoming message.  
Checked by AVG Free Edition.  
Version: 7.5.476 / Virus Database: 269.10.14/912 - Release Date: 7/22/2007 7:02 PM

No virus found in this outgoing message.  
Checked by AVG Free Edition.  
Version: 7.5.476 / Virus Database: 269.10.14/912 - Release Date: 7/22/2007 7:02 PM

27/07/2007